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well morphology, taxonomy, ecology, physiology, what not. Then a few pages are devoted to minute structure, and a review of forms follows with the highest spermatophytes leading the procession, and in the usual modern proportion of about four pages of spermatophytes to one of the "sporophytes" (the author's word).

The physiology is divided into the chemical and physical processes within, and the "biology," *i. e.*, relations to environment; a separation not without difficulty. Three pages are devoted to "something about plant geography," and a key for identifications completes the work. The text is exceptionally clear, simple, and free from technical phraseology. Most of the illustrations are borrowed from the *Natürlichen Pflanzenfamilien*, which is sufficient commendation.—JOHN G. COULTER.

MINOR NOTICES.

THE WRITINGS of Professor Dr. P. Magnus, of Berlin, include much matter that is of moment to American botanists. Dr. Magnus is a student of fungi, but writes to some extent upon other subjects. His interests are catholic, and he has often contributed to the solution of problems arising in distant quarters of the globe. A number of separates (which he generously sends to all whom he knows to be interested in such subjects) have recently come to hand, and the opportunity is taken to give a brief account of their contents.

In a communication to the *Botanisches Centralblatt*⁵ some criticisms are offered upon the treatment given the Hemibasidii and Uredinales by Dr. Dietel in Engler and Prantl's *Natürliche Pflanzenfamilien*. It is pointed out that the sorus of Doassansia is never imbedded in the parenchyma of the host, as stated by Dietel (*I. c.*, p. 21), but always lies immediately beneath and in contact with the epidermis. He reviews the genera Doassansia and Burrillia and their subgenera as characterized by Setchell, and holds them to be more logical and natural than the arrangement proposed by Dietel. Turning to the Uredineæ he states that *Puccinia Schweinfurthii* Magn. forms witches' brooms, and should not be confounded with *P. Mesneriana* Thüm, or *P. digitata* Ell. & Hark., which never do so, although otherwise much alike. Exception is taken to the establishment of the genus Phragmopyxis with a layer around the spores that swells in water, while ignoring Schröter's genus Uropyxis with just the same claim to recognition. It is pointed out that aside from this equivocal character, Uropyxis possesses good generic characters in the number and position of the teleutosporic pores. The suppression of the genera Xenodochus and Chaconia, and the grouping of some of the genera are not approved.

⁵ Einige Bemerkungen zu P. Dietel's Bearbeitung der Hemibasidii und Uredinales in Engler-Prantl Natürliche Pflanzenfamilien Bd. I.—Bot. Centr. 74 : 165-170. 1898.

An extended account of the structure and occurrence of some new species: *Phleospora Jaapiana*, from Germany,⁶ *Aecidium Opuntiae* from Bolivia,⁷ and *Aecidium Jacobsthali-Henrici* from the Straits of Magellan,⁸ with fine detailed illustrations in each case, gives much information beside the usual diagnoses.

In 1897 Dr. Magnus traveled in the United States, and he took the opportunity to make observations upon the lilac mildew⁹ so familiar to everyone in this country, and especially to all pupils in college classes in botany. In Europe the lilac is free from mildew, only one collection being recorded, and that proved to be *Microsphaera Ehrenbergii* Lev., a common species on *Lonicera tartarica*. The American form was for a time referred by American botanists to *M. Friesii* Lev., but since the study of it by Burrill in the preparation of his article on the Parasitic Fungi of Illinois, it has been called *M. Alni* (DC.) Wint. Dr. Magnus shows that although it is very closely related to *M. Alni* of Europe, yet there are some morphological differences which indicate that it is geographically modified, and entitled to a separate name. Priority requires that it be called *M. Syringae* (Schw.) Magn., which he considers unfortunate in view of the fact that the American forms upon *Betula*, *Corylus*, *Castanea* and *Ilex* must also be placed under it, all being native plants while *Syringa* is introduced, and is therefore a comparatively recent host for it. Attention is called to the fact that so far no cultural studies have been made among the Erysipheæ to determine relationship.

While in this country Dr. Magnus read a paper at Toronto before the British Association for the Advancement of Science upon the mycelium of witches' brooms of the barberry¹⁰ in Europe. It had been asserted by Eriks-son that the mycelium of this Aecidium penetrates the cells of the host, and develops colored granules within, both being exceptional for members of the Uredineæ, but both claims are shown to be errors. This is the Aecidium of *Puccinia Arrhenatheri* (Kleb.) Eriks.

In a short communication to *Hedwigia* on *Puccinia Lycii* Kalchbr.,¹¹ some errors in the original description are noted, and also an increase in the number of pores of the uredospores corresponding to an increase in size.

⁶ Eine neue Phleospora. *Hedwigia* 37: 172-174. 1898.

⁷ Eine neues Aecidium auf *Opuntia* sp. aus Bolivia. Ber. d. deutsch. Bot. Ges. 16: 151-154. 1898.

⁸ Ein auf *Berberis* auftretendes Aecidium von der Magellanstrasse. Ber. d. deutsch. Bot. Ges. 15: 270-276. 1897.

⁹ Der Mehltau auf *Syringa vulgaris* in Nordamerika. Ber. d. deutsch. Bot. Ges. 16: 63-70. 1898.

¹⁰ On *Aecidium graveolens* (Shuttlew.). Ann. Bot. 12: 155-163. 1898.

¹¹ Ein kleiner Beitrag zur Kenntniss der *Puccinia Lycii* Kalchbr. *Hedw.* 37: Beiblatt 91-93. 1898.

The teleutospores are also exceptional in having the pore of the lower cell at the bottom rather than in the upper part.

Two articles before us are of local interest,¹² but another, the last to be mentioned, brings out the interesting fact that the production of lateral flowering stems from the base of the common century plant, *Agave Americana*,¹³ when the central shaft has been injured, was recorded as early as 1705.—J. C. A.

THE ADVISABILITY of using pure cultures of yeasts in the process of fermentation in breweries has been clearly demonstrated by a number of writers. It has been suggested frequently that the same purity of yeasts is no less desirable in the manufacture of bread, and in order to determine whether this is true, Miss Katherine E. Golden has made a study of several commercial yeasts and their effects.¹⁴ It was found that almost all market yeast packages contain corn or potato starch; and that they are adulterated with alum which is added as an antiseptic against bacteria and molds. The bacteria were constantly present, however, and the molds in many of the packages. These greatly change the fermentative effect of the yeasts, and produce unpleasant odors which are indications of the less nutritive condition thus induced in the bread.

Experiments were made to test the efficiency of various commercial yeasts, and of pure cultures made from the same. It was found that young cultures of pure yeast would bring a much greater fermentation in bread sponge in less than half the time required by ordinary market yeast. With such pure cultures the desired fermentation within the sponge is secured before there has been sufficient time for undesirable organisms to develop. This is not true with the yeasts usually employed, since by waiting for the necessary fermentation there occurs frequently a large and injurious growth of bacteria and molds which begin to induce putrefaction in the sponge. When pure and vigorous yeasts were used the bread was always sweet, and remained good much longer than when made with the adulterated cake. The flavors of good bread may be varied by the use of various kinds of yeasts. If the same care is used in this manufacture as is used in the

¹² Zweiter Beitrag zur Pilz-Flora von Franken. Abh. d. Nat. Ges. Nürnberg II: 23-57. *Pl. 1.* 1898.

Ein weiterer Beitrag zur Kenntniss der Verbreitung der *Thorea ramosissima* Bory im mittleren Deutschland. Deutsch. Bot. Monatssch. 1898: 17-18.

¹³ Blühen der Agaven an Seitentrieben, von Dr. Otto Kuntze. Mit Bemerkungen zu den vorhergehenden Mittheilungen, von P. Magnus. Gartenflora 1898: 215-216.

¹⁴ GOLDEN, KATHERINE E.—(1) Yeasts and their properties. 8°. pp. 28. (2) On bread and bread-making. 8°. pp. 22. Purdue University Monographs; Series relating to food, nos. 5 and 6. 1898. (3) Pure yeast in bread. Proceedings of Indiana Academy of Science 1897: 62-64. 1898. (Reprint repaged!)

selection of yeasts for the manufacture of beer and other liquors, a very much finer quality of bread may be secured, and many deleterious effects may be avoided.

Further work was done to determine whether the yeast cells live in bread after baking, and the conclusion was reached that yeasts are always killed by the heat necessary to bake the bread. If living yeast cells were taken into the alimentary canal, however, they would probably produce no bad results as experiments made seem clearly to demonstrate.

The papers contain most careful and interesting descriptions of the many kinds of bread and the best processes of making them.—OTIS W. CALDWELL.

THE FLORA of Costa Rica has been receiving its share of attention, the results appearing in parts under the title *Primitiæ Floraæ Costaricensis*. Parts I—III were published at Brussels in 1891, 1893, and 1896, respectively, under the joint direction of Th. Durand and H. Pittier. These three parts completed the first volume, and at its close M. Durand was compelled to withdraw from the undertaking. The first part of the second volume has now appeared,¹⁵ published at St. José de Costa Rica, under the auspices of the National Geographical Institute, and with M. Pittier as sole editor. Mr. J. Donnell Smith has contributed the part by preparing a list of the known Polypetalæ, including descriptions of new or recently described species, and omitting those families which have been presented in previous parts. It is a great gratification to those interested in the American tropics that this important publication is to be continued.—J. M. C.

PROTOPLASMIC streaming in Characeæ has been again investigated and is discussed from a strictly physiological point of view by Dr. Georg Hörmann in an extended paper, independently published.¹⁶ He seeks a theoretical explanation of the movement of streaming and the conduction of impulses. An explanation of the direction and plane of streaming, both in cells of the axes and rhizoids, Hörmann finds in the advantage of securing the shortest route from the places of absorption or manufacture to the places of utilization of the materials, which thus, in their transfer, are subject to a minimal loss. The larger part of the paper is devoted to a discussion of experiments to ascertain the causes and nature of the movement, and the conduction of stimulation impulses. In his experimental work the application and ingenious adaptation of the modern methods of animal physiology yield new and valuable suggestions as to the theory of movement.

¹⁵ PITTIER, H.—*Primitiæ Floraæ Costaricensis*. Vol. II, pp. 1–126. Polypetalae. By John Donnell Smith. San José de Costa Rica. 1898. \$1.00.

¹⁶ HÖRMANN, GEORG.—*Studien über den Protoplasmaströmung bei den Characeen* 8°. pp. iv + 79. figs. 12. Jena: Gustav Fischer. 1898. M 2.

Finding that, just as in muscle and nerve, the nitella cell may be stimulated by the production of katelectrotonus and the disappearance of anelectrotonus and that the stimulation wave is accompanied by the so-called "negative" wave, he concludes that muscle, nerve, and nitella cell must have some fundamental structural element in common. As the nerve has only conductivity he concludes that conductivity and contractility are properties of different substance. The conductive plasma, existing alone in the nerve, is accompanied in muscle and nitella cell by another substance, which conditions the phenomena of contraction and streaming. Nor has he overlooked the difference between muscle and nitella, in that a stimulus in the one case causes a resting organ to work, while in the other it brings a working organ to rest.

The explanation of this is to be found only in a fundamental difference in the structure of the mechanism of movement. The details of the discussion must be sought in the work itself.—C. R. B.

DR. P. SYDOW has brought together much useful information in a botanical calendar.¹⁷ Besides the astronomical calendar, there is a calendar for notes and memoranda for each day, with the birth and death days of many distinguished botanists; tables of equivalents in money, weights, and measures; post and telegraph rates; the Berlin rules for nomenclature; a list of the cryptogamic exsiccatae which have been issued; a list of the botanic gardens and museums; and finally a list of the botanical collections to be found in the larger museums and herbaria. The difficulty of securing accuracy and completeness in the last three lists is very great. The author realizes that it has not been attained and appeals for assistance by corrections.—C. R. B.

A VERY USEFUL ACCOUNT of the economic grasses, by F. Lamson-Scribner, has been published as Bulletin 14 of the grass and forage investigations of the Division of Agrostology, Department of Agriculture. Brief descriptions and illustrations are given of the more important economic grasses of this country, or those which have been introduced because possessing some merit. Bulletin 15 of the same division is a report upon the forage plants and forage resources of the Gulf states, by S. M. Tracy, containing descriptions, comments, and illustrations, in addition to the general discussion of the forage problems of the south.—J. M. C.

F. H. KNOWLTON has done botanists great service in the preparation of his *Catalogue of the Cretaceous and Tertiary plants of North America*.¹⁸ The

¹⁷ SYDOW, P.—Deutscher Botaniker-Kalender für 1899. 16mo. pp. 198. Berlin: Gebrüder Borntraeger. 1898. M 3.

¹⁸ KNOWLTON, F. H.—Bulletin of the U. S. Geological Survey no. 152. pp. 1-247. Washington, 1898. 20 cents.

first catalogue of the kind was that of Lesquereux, published more than twenty years ago, and containing 706 species. The present catalogue testifies to the fact that since that time species have been described with great industry. Although no statement is given as to the number of species, it is remarked that the Potomac flora alone now numbers more than the total Cretaceous and Tertiary floras known to Lesquereux. The catalogue is a real bibliography and must prove of great service.—J. M. C.

NOTES FOR STUDENTS.

H. H. DIXON has turned his attention to transpiration, and in Proc. Roy. Irish Soc. III. 4: 618-635. 1898 discusses the effects of stimulative and anaesthetic gases on transpiration, and transpiration into a saturated atmosphere.—C. R. B.

CZAPEK points out¹⁹ an interesting case of adaptation in leaves of *Cirsium eriophorum*. Plants growing in very sunny situations on the southerly mountain slopes in central Bohemia had the segments of their pinnatifid leaves erected into two comb-like rows, while in shady places these are transverse. The erect segments of the sun-beaten leaves were inrolled at the edges and were different in structure from the shade leaves, having palisade cells 25 per cent. longer, and richer in chlorophyll. The same difference was remarked between the erect segments and transverse portions of the same leaf.—C. R. B.

THE CYTOLOGY of the yeast cell has been a difficult matter to investigate, but important results have been obtained by Janssens and Leblanc.²⁰ They used malachite green, dahlia, gentian violet, Delafield's hæmatoxylin, and "black hæmatoxylin" (black hæmatoxylin differs from Delafield's in that the ammonia alum of the latter is replaced by iron alum). These stains show that every yeast cell contains a nucleus and a nucleolus. During budding there is indirect division of the nucleus in some species, while in the common *Saccharomyces cerevisiae* and some others the division is direct. Cells about to produce spores contain two nuclei which fuse. The resulting spore on germination shows a much modified form of division. The paper is illustrated by excellent plates.—CHAS. J. CHAMBERLAIN.

UNDER THE TITLE *Analecta bryographica Antillarum* Dr. Karl Müller-Halle has published²¹ a long list of mosses from the Greater and Lesser

¹⁹ Oesterr. bot. Zeit. 48: 369-371. 1898.

²⁰ JANSSENS, FR. A. and LEBLANC, A.—Recherches cytologiques sur la cellule de levure. La Cellule 14: 203-343. 1898.

²¹ Hedwigia 37:(2-?) 266. 1898.